

Brumptaemilius gabonensis n. sp.
(Ransomnematinae, Rhigonematidae, Nematoda)
from *Pachybolus* sp. (Spirobolida, Diplopoda) from Gabon
with comments on the Ransomnematinae

par Martin L. ADAMSON

Abstract. — The nematode *Brumptaemilius gabonensis* n. sp. (Rhigonematidae; Ransomnematinae *sensu* Theodorides, 1965) is described from *Pachybolus* sp. (Pachybolidae; Spirobolida; Diplopoda) from Gabon. The new species is similar to *B. oschei* Dollfus, 1964, in having a robust and relatively short tail in the male but differs from this species since in *B. gabonensis* the tail of the male is much shorter, the form of the *area rugosa* very different and the spicules unequal. *Brumptaemilius* Dollfus, 1952, presents an ensemble of characters in the male which are primitive for the Ransomnematinae : among others, three broad lips, an outer circle of cephalic papillae consisting of four pairs of well-separated nerve endings, three prominent feather-like cuticular projections at the base of the buccal cavity and three tiny three-pointed teeth posterior to these projections and apparently homologous to similar structures observed in free-living rhabditids. It is suggested that *Carnoya* Gilson, 1898, and *Rondonema* Artigas, 1926, evolved from a *Brumptaemilius*-like ancestor and the host distributions of these genera are discussed.

Résumé. — Le Nématode *Brumptaemilius gabonensis* n. sp. (Rhigonematidae, Ransomnematidae *sensu* Theodorides, 1965), parasite intestinal de *Pachybolus* sp. au Gabon, est décrit. La nouvelle espèce ressemble à *B. oschei* par la queue robuste du mâle, relativement courte chez *B. oschei*, mais beaucoup plus courte encore chez *B. gabonensis* n. sp., une *area rugosa* de forme très différente et des spicules inégaux. *Brumptaemilius* Dollfus, 1952, présente chez le mâle un ensemble de caractères primitifs pour les Ransomnematinae : entre autres, trois larges lèvres, un cycle externe de papilles céphaliques composé de quatre paires de terminaisons nerveuses bien séparées, trois projections cuticulaires proéminentes en forme de plumes à la base de la cavité buccale et trois minuscules dents trifides situées postérieurement à ces projections et apparemment homologues aux structures semblables observées chez les Rhabditides libres. Nous suggérons que *Carnoya* Gilson, 1898, et *Rondonema* Artigas, 1926, sont dérivés d'un ancêtre proche de *Brumptaemilius*, et les spectres d'hôtes de ces genres sont discutés.

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A previous communication (ADAMSON, 1983c) reported on two new species of rhigonematid nematodes taken from the posterior intestine of a female *Pachybolus* sp. (Pachybolidae; Spirobolida; Diplopoda). In the same location in the same host individual, many specimens of another new species, *Brumptaemilius gabonensis* n. sp. (Rhigonematidae ;

Ransomnematinae *sensu* Theodorides, 1965), were found. The species is described here and phylogenetic relationships among the Ransomnematinae are discussed.

Brumptaemilius gabonensis n. sp.

MATERIALS AND METHODS : The host, a single female specimen, was collected in Gabon by Dr. O. BAIN (Laboratoire de Zoologie, Muséum national d'Histoire naturelle, Paris) and identified by Dr. J. P. MAURIÈS (Laboratoire des Arthropodes, Muséum national d'Histoire naturelle). It is stored in the Myriapod collection of the Laboratoire des Arthropodes in the Paris Museum. Nematodes were fixed in hot 70 % ethanol and stored in 70 % ethanol before being cleared and examined in lactophenol. Type and other specimens are stored in the parasite collection of the Paris Museum (Laboratoire des Vers : 34 RA).

DESCRIPTION

Male

Cephalic extremity with one dorsal and two subventral slightly developed broad lips; inner edge of each lip with thin, anteriorly directed cuticular membrane. Inner circle of six small papillae just inside buccal cavity. Outer circle of papillae consisting of four submedian pairs of nerve endings, smallest element of each pair slightly more labial in position. Amphids at base of subventral lips.

Body cuticle with irregular wrinkles in labial region, fine striations (1 to 2 μm apart) just posterior to lips and larger striations (4 to 5 μm apart near base of oesophagus) on rest of body. Striations ending at level of last pair of caudal papillae.

Buccal cavity divided into three portions: short anterior segment, subtriangular in apical view, lined by cuticle continuous with body cuticle; long, subdivided middle section, subtriangular in apical view anteriorly but variously compressed posteriorly, many fine anteriorly directed cuticular hairs present on inside surface of its cuticular lining; long posterior section lined by thick layer of cuticle with one dorsal and two subventral feather-like cuticular projections and, posterior to each of these, a small three-pointed tooth; this portion of buccal cavity surrounded by oesophageal tissue.

Oesophageal corpus with triradiate lumen. Cuticle lining radial canals very finely striated in side view; that lining section of lumen which connects radial canals bearing coarse criss-crossing striations in side view.

Excretory system consisting of inconspicuous pore and long tubular terminal duct expanding posteriorly into cell-body on left ventral side of body; horizontal canals leaving cell body on either side (right canal longer than left) and communicating with anterior and posterior lateral canals.

Two lateral cervical papillae (deirids) present between nerve ring and excretory pore. Occasional somatic papillae present throughout length of body. Narrow lateral alae extending from level of oesophageal bulb to 300 to 400 μm anterior to anus. One coelomocyte near base of oesophageal corpus and another just anterior to flexure of testis.

Fifteen caudal papillae present: two pairs of prominent submedian rosette papillae well anterior to anus; one pair submedian and one pair sublateral rosette papillae immedia-

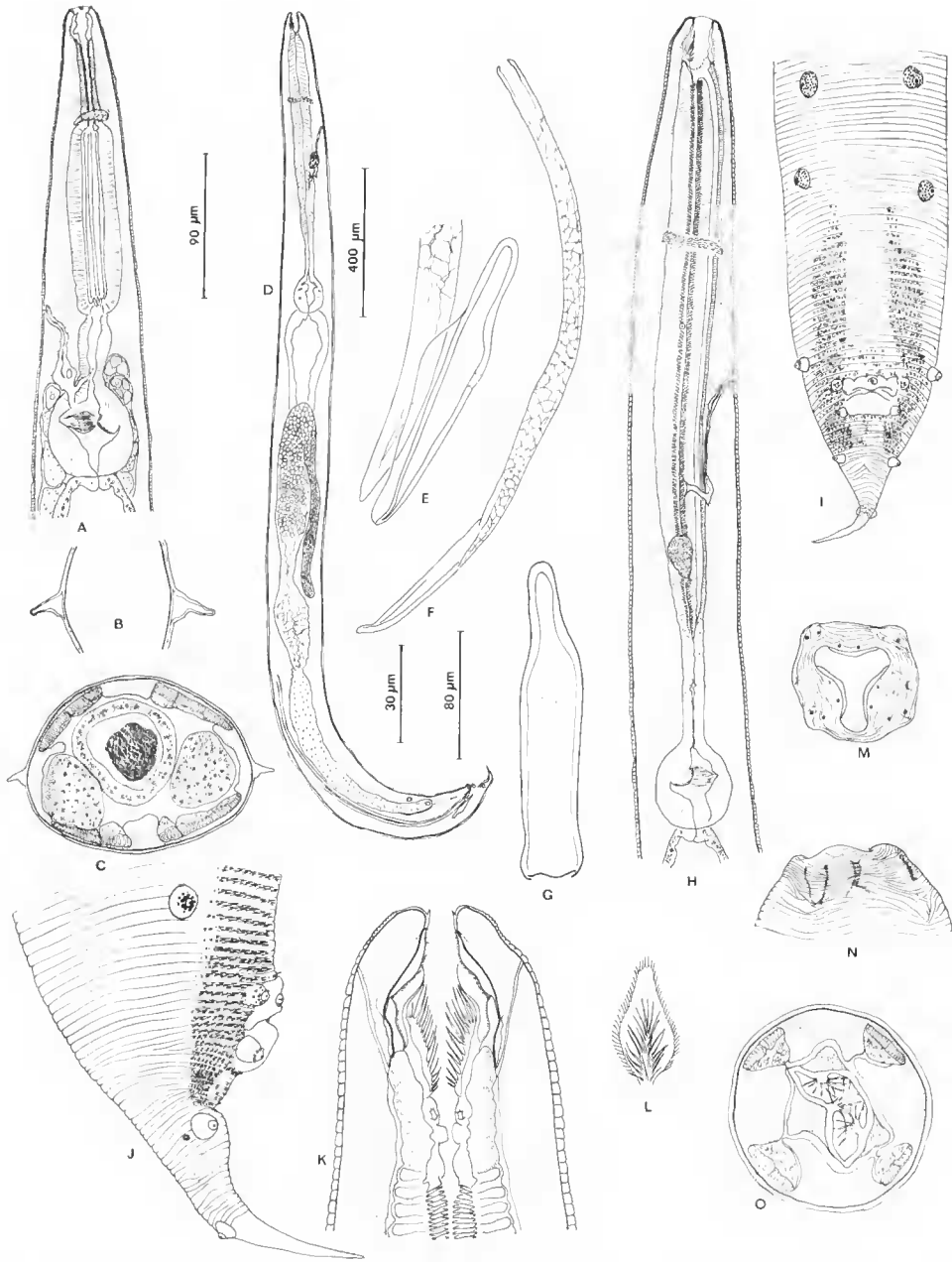


FIG. 1. — *Brumptaemilius gabonensis* n. sp. : A, oesophageal region of female, lateral view ; B, detail of lateral alae in female ; C, cross-section through female just anterior to vulva ; D, entire male, lateral view ; E, extremity of left spicule and gubernaculum, lateral view ; F, right spicule, lateral view ; G, gubernaculum, dorsal view ; H, oesophageal region of male, lateral view ; I, posterior extremity of male, lateral view ; J, caudal extremity of male, lateral view ; K, optical section through buccal cavity and anterior extremity of oesophagus, dorsal view ; L, one of three feather-like cuticular projections at base of buccal cavity of male ; M, superficial apical view of male ; N, anterior extremity of male, lateral view ; O, optical section through base of buccal cavity of male, apical view. (A and H = 90 μm scale ; B, E, G, J, K, L, M, N and O = 30 μm scale ; C, F and I = 80 μm scale ; D = 400 μm scale.)

tely anterior to anus ; one median unpaired papilla on anterior anal lip ; two pair submedian and one pair subdorsal postanal papillae. Phasmids just lateral to second last pair of caudal papillae.

Area rugosa present in anal region, consisting of two subventral fields of small conical projections commonly with double or triple extremities ; each field beginning ventral and just posterior to second pair of caudal papillae and extending to just anterior to second last pair of papillae.

Spicules arcuate, close together throughout their length and with faint scale like ornamentation on outer surface. Left spicule about twice as long as right. Gubernaculum prominent with faint hole in dorsal surface.

Female

Cephalic extremity blunt. Cephalic sense organs located at edge of mouth opening and consisting of prominent amphids, four large spherical outer papillae each with two nerve endings and six small inner papillae just inside buccal cavity. In many specimens, cephalic extremity contracted (presumably fixation artifact) such that all cephalic sense organs are in buccal cavity.

Body cuticle on cephalic extremity with four prominent annulations ; posterior border of first three annules overhanging subsequent annules slightly. Posterior to this body cuticle with prominent striations 5 to 8 μm apart.

Longitudinal rows of cuticular spines present in cervical region beginning just behind cephalic annulations and arranged as follows : four sublateral rows each with four spines ; posterior to these, four submedian (two subdorsal and two subventral) and four sublateral (two on each side) rows each with 10 to 18 spines ; occasional ' stray ' spines present between these rows, especially anteriorly.

Deirids present near middle of broad section of oesophageal corpus ; excretory pore just behind this.

Each ovary beginning in region of oesophageal isthmus running posteriorly and emptying into oviduct ; each oviduct leading through seminal receptacle just anterior to anus and emptying into common uterus ; uterus leading anteriorly to vagina which flexes posteriorly before vulva. Vulva subventral on left side of body, its anterior lip swollen. Eggs with thin inflexible shell, containing embryo in early stage of development.

Short narrow lateral alae present just anterior to vulva. Occasional somatic papillae present, irregularly distributed on body and very numerous just anterior to vulva ; three to eight of these prevulvar papillae markedly larger than rest.

DIMENSIONS

Male (holotype followed by range of three paratypes in parentheses) : Length 2.93 (2.96-3.03) mm. Maximum width 160 (155-170) μm near midbody. Buccal cavity 58 (52-56) μm , oesophageal corpus 705 (692-709) μm and isthmus 77 (64-88) μm long. Bulb 100 (100-102) μm long and 88 (84-91) μm wide. Nerve ring 270 (253-275) μm , deirids 352 (338-378) μm and excretory pore 419 (401-420) μm from anterior extremity. Right spicule 462 (443-494) μm , left spicule 863 (815-932) μm , gubernaculum 112 (105-121) μm and tail 116 (123-147) μm long.

Female (allotype followed by range of three paratypes in parentheses) : Length 4.47 (3.76-4.50) mm. Maximum width 282 (278-301) μm between vulva and anus. Buccal cavity with anterior

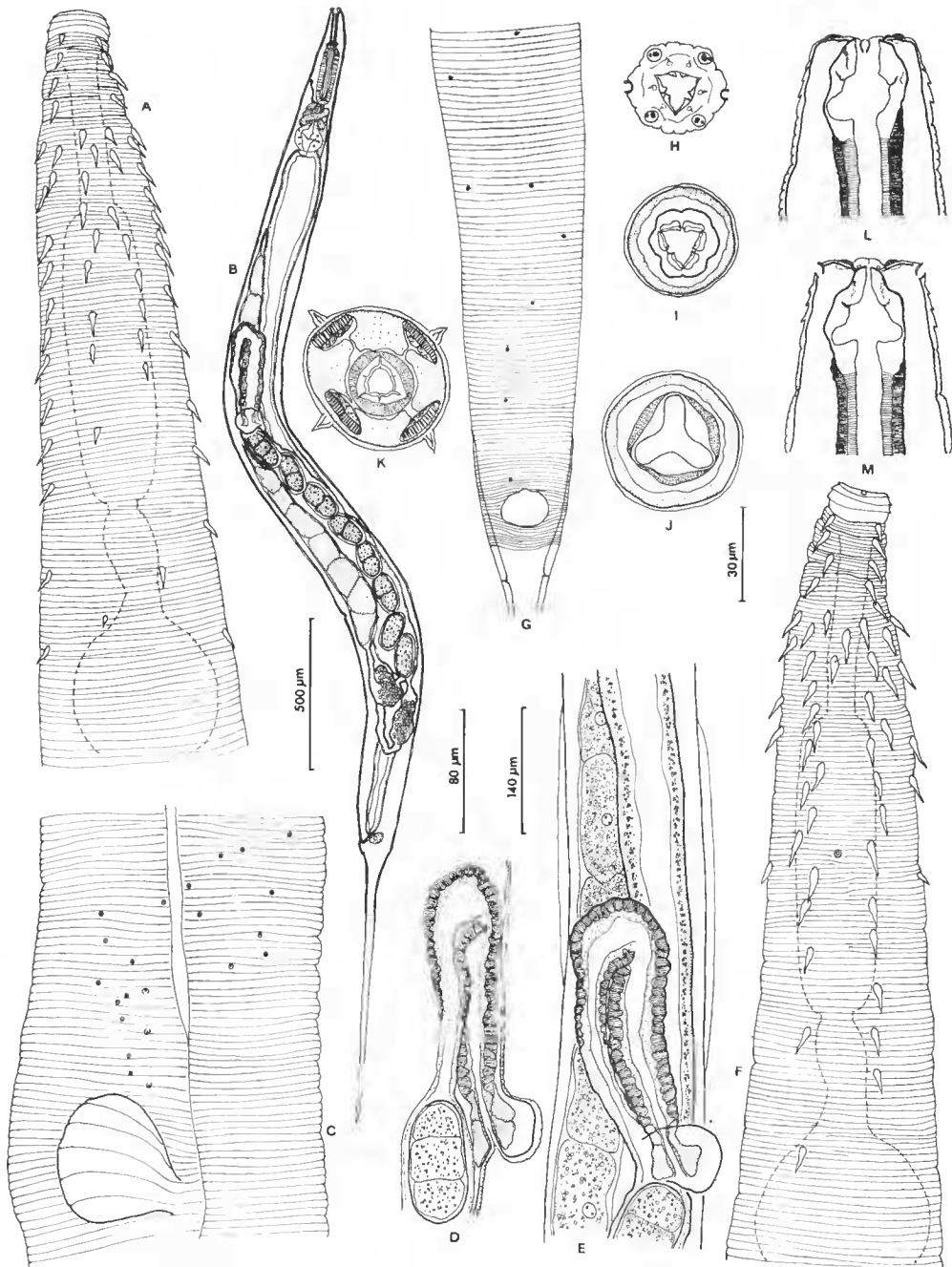


FIG. 2. — *Brumptaemilius gabonensis* n. sp., female : A, anterior extremity, dorsal view ; B, entire worm lateral view ; C, vulvar region, lateral view showing concentration of somatic papillae anterior to vulva ; D and E, vulva and vagina in profile and in ventral view (note lateral alae in E) ; F, anterior extremity, lateral view showing position of deirid ; G, anal region, ventral view showing somatic papillae ; H, superficial apical view ; I, section through anterior end of buccal cavity ; J, section through base of buccal cavity ; K, section through anterior section of oesophageal corpus ; L, cephalic extremity, lateral view ; M, cephalic extremity, dorsal view. (A, C and F = 80 μ m scale ; B = 500 μ m scale ; D, E and G = 140 μ m scale ; H to M = 30 μ m scale.)

portion 9 (6-9) μm and posterior portion 23 (23-27) μm long. Anterior narrow portion of oesophageal corpus 107 (88-102) μm , posterior broad portion of oesophageal corpus 217 (188-301) μm and isthmus 82 (75-82) μm long. Bulb 114 (88-109) μm long and 99 (91-104) μm wide. Nerve ring 134 (116-121) μm , deirids 275 (239-356) μm , excretory pore 318 (281-388) μm and vulva 1.74 (1.38-1.72) mm from anterior extremity. Tail 845 (905-1 054) μm long. Eggs 145-155 (126-140) μm long and 72-83 (65-84) μm wide.

DISCUSSION

DOLLFUS (1952) proposed *Brumptaemilius* for *B. sclerophorus* from an unidentified diplopod from French Guinea. OSCHÉ (1960) gave a detailed description of another species from an African (he did not specify further the locality) spirostreptid diplopod and referred to it as *B. sclerophorus*. DOLLFUS (1964) proposed the name *B. oschei* for this species and described nine additional new species from diplopods from the Belgian Congo. Except for *B. sclerophorus*, *B. oschei* and the present species, *Brumptaemilius* spp. are known only on the basis of the caudal extremity of the male.

Brumptaemilius gabonensis is most similar to *B. oschei* in that the tail of the male is relatively short and robust (not filiform as in other members of the genus). Both species belong to 'group 1' of DOLLFUS (1964). The new species is easily distinguished from *B. oschei* since the tail of the male is shorter, the form of the *area rugosa* different and *B. gabonensis* is the only species in the genus with unequal spicules.

Brumptaemilius belongs to that group of rhigonematids in which males lack a ventral sucker and the oesophageal corpus of the female is divided into narrow anterior and broad posterior portions. Also included are *Carnoya* Gilson, 1898, *Rondonema* Artigas, 1926 (= *Pararondonema* Travassos in KLOSS, 1961; ? = *Angranema* Travassos, 1949), *Clementeia*¹ Artigas, 1930, *Urucuia* Kloss, 1961, and *Raonema* Kloss, 1965.

Rondonema, from South America is the genus most similar to *Brumptaemilius*. In males of both genera the cephalic extremity is broad and the buccal cavity long, its anterior section lined by a thin layer of smooth cuticle and its posterior section with three cuticular projections at its base; the form of the gubernaculum is similar, the last pair of caudal papillae in the male are subdorsal in position and the vulva opens into an anteriorly directed vagina. The genera are easily distinguished since in *Rondonema* there are no lips, the projections at the base of the buccal cavity are reduced and there is no *area rugosa*. Furthermore, spines in the cervical region of *Rondonema* are restricted to the lateral fields and appear to be formed in a manner similar to lateral alae (ADAMSON, 1983 a) whereas those in *Brumptaemilius* may occur on all sides of the body.

Brumptaemilius is primitive for a variety of morphological characters :

1. There are three broad lips in males. Lips are lacking in most rhigonematids.

1. *Clementeia*, with type species *C. clementeia*, was described by ARTIGAS (1930) as having a ventral sucker in the male but KLOSS (1965) noted that male described by ARTIGAS was a *Heth*. ARTIGAS' specimens apparently had been lost and KLOSS (1965) redescribed *C. clementeia* from neotypes from the type locality noting that males lacked a ventral sucker. Males described by DOLLFUS (1952) as types of *C. tubulifera* are also, as KLOSS noted, males of *Heth*. I have examined males of *C. trispiculata* Dollfus, 1952 (MNHN : Laboratoire des Vers : BD 8) and was unable to find the ventral sucker referred to by DOLLFUS. Thus, *Clementeia* should be considered as lacking a ventral sucker.

There are three lips in *Carnoya*, however ; these are broad in species primitive for this character but are slender and well separated in more evolved forms (ADAMSON, 1983 b).

2. The external circle of cephalic sense organs in males (at least those of *B. gabonensis*) consists of four submedian pairs of nerve endings which are easily related to the scheme worked out by DE CONINCK (1942) for many free-living forms. The larger element of each pair is slightly more posterior and presumably corresponds to the submedian cephalic papilla whereas the smaller elements would correspond to the subdorsal and subventral external labial papillae of DE CONINCK (the lateral external labial papillae having disappeared). The cephalic and external labial papillae are fused in most rhigonematids including females of *Brumptaemilius*.

3. The three cuticular projections at the base of the buccal cavity are characteristic of all Ransomnematinae *sensu* Theodorides, 1965. They are prominent and feather-like in males of *Brumptaemilius* as they are in *Ransomnema*, males of some *Heth* spp. and larval but not adult *Rondonema* ; they are secondarily reduced in more specialized forms.

4. Posterior to the above formations in *Brumptaemilius* are three tiny three-pointed teeth which OSCHNE (1960) considered homologous to similar structures observed in free-living rhabditids. These have not been observed in other rhigonematids.

5. In all members of the Ransomnematinae there has been a reduction in the number of caudal papillae but their disposition is surprisingly constant within the subfamily (ADAMSON, 1983 b). The most primitive forms (including *Brumptaemilius*, *Ransomnema*, and certain *Heth* spp.) have seven paired and one unpaired papillae whereas more specialized forms have lost the sublateral adanal pair.

6. *Brumptaemilius* is the first rhigonematid in which deirids have been described. It is not certain that their presence is a primitive character but they do tend to be lacking in the more specialized members of groups in which they occur.

Brumptaemilius appears to be the most primitive of the Ransomnematinae which lack a ventral sucker in the male ; *Carnoya* and *Rondonema* probably evolved from a *Brumptaemilius*-like ancestor but it is difficult to say anything precise concerning *Clementeia*, *Urucuia* and *Raonema* since their morphology is so poorly known.

Brumptaemilius gabonensis is the first species of the genus to be described from the Spirobolida, all previous species having been found in the Spirostreptida. This is interesting since *Carnoya* and *Rondonema* occur in the Spirobolida but not the Spirostreptida. Furthermore, *Rondonema* has been reported from the Pachybolidae (the family to which the host of *B. gabonensis* belongs) (TRAVASSOS and KLOSS, 1960). *Carnoya*, the most specialized of the three genera, seems to be restricted to the Rhinocricidae, itself the most specialized family of the Spirobolida.

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